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CONCERNING MELANODIMORPHISM IN KILLIFISHES

IN Copeia No. 128, p. 33, Mr. C. R. Halter has referred to the black blotching often seen on male *Gambusia*. It is well known that, in many species of tropical American killifishes, individuals occur with a peculiar velvet-black blotching, varying from a mere speckling or scale-dotting to an entire black coloring of the fish. No satisfactory explanation of this phenomenon, which for convenience we may call melanodimorphism, has been given. Why it is confined to the Pœciliidæ, and more specifically, only to the American species found in warmer regions, is unknown.

Although it has generally been supposed that the males alone of *Gambusia affinis holbrookii*[1] may be spotted, this is not altogether true. I have seen an entirely black and a speckled female of this species, and a black female has been reported and figured by W. Köhler.[2] E. Herold[3] has reviewed several other records. Mr. Jack Beater of Fort Myers, Fla., tells me that he has collected a single black-spotted female.

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[1] I can accept the eastern form of *G. affinis* only as a subspecies upon the evidence so far presented. See Geiser, American Midland Naturalist, VIII, pp. 175-188.

[2] Blätter für Aquarien u. Terrarienkunde, XVII, 1906, p. 297 (figs. on pp. 295-296).

[3] Ibid., XVIII, 1907, p. 36.

While in *Gambusia* it is nearly always the male that is black-spotted, in other fishes the ratio is much different. *Mollienisia sphenops* has apparently a nearly even sexual ratio of spotted specimens, if we may judge from aquarium literature. The black spots so irregularly placed in *Platypœcilus maculatus maculatus* are the true coloring of the fish but the black suffusion seen in *Platypœcilus maculatus pulcher* and in hybrids of this variety, *Xiphophorus helleri*, seems to be melanodimorphism. In these cases the black speckling is present in both sexes. Three specimens of *Platypœcilus couchianus*, from Linares, Nuevo Leon, Mexico, collected by the late Dr. S. E. Meek (Field Museum No. 4441), now before me, are equally sparsely spotted on scattered scales. One is a female, the other two are males. Meek has said "black specks" in his description of this fish, but I doubt if he referred to these blotches. In *Phalloceros caudimaculatus* the sexes may be equally spotted, though this coloration seems always confined to a comparatively light speckling in this fish. Fowler[4] has mentioned this species and aquarists have long known the speckled form under the erroneous names "*Girardinus reticulatus*" and "*Phalloptychus januarius*".

Fowler, (loc. cit., p. 438), has also reported a black-speckled example of *Mollienisia latipinna*. Mr. Beater has sent north numerous live specimens of nearly entirely black *Mollienisia latipinna* of both sexes from Ft. Myers. The great black banner-like dorsal fins of the males are imposing in the aquarium.

So far as I can ascertain there has been no published record of a melanodimorphic ki[illegible] belonging to any but the viviparous sub-family *Pœciliinæ*. It is thus interesting that numerous examples of *Fundulus chrysotus* collected by Mr. Beater are heavily sprinkled or blotched with black on the body and fins. In some of these specimens the spotting is finer and more "peppered" than in any of the other melanodimorphic species I have examined, while in others it is the usual

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[4] Proc. Acad. Nat. Sci. Phila., 1916., p. 437.

blotching. Males and females are equally marked.

Eigenmann[5] has reported what may be a peculiar phase of melanodimorphism in the male of the Cuban *Girardinus metallicus.* I have examined some of Eigenmann's material and find the "smear" on the male's under side is decidedly brownish. True melanodimorphic killifishes never seem to turn from their deep black in alcohol. However, in a lot of seven *Girardinus metallicus* in the American Museum (No. 8348), from the San Carlos estate at Guantanimo, is a single adult male heavily black-blotched, as in *Gambusia.*

I have recently had the opportunity of collecting *Gambusia* at Wilmington, N. C. Numerous black males were taken in Greenfield Lake, a large cypress lake near town. There was usually one black one (rarely two) in each little school of *Gambusia* and he could be plainly seen chasing the other males and the females. The lake has been dammed off from tidal water for many years. It was very low when I visited it and Mr. and Mrs. J. H. Cummings, collectors, with whom I stayed, said that in other years, when the lake was full, black males were much less abundant, per school. Some have had the opinion that black male *Gambusia* have a shorter intromittent anal fin than unspotted normal males. I do not find this true in my Florida and North Carolina specimens.

Black *Mollienisia latipinna* produce some percentage of spotted offspring, and a black male *Gambusia,* bred with an ordinary female, will produce young in which nearly all the males are spotted. Spotted *Phalloceros* breed almost wholly true, seldom even one in a brood being unspotted. The young of none of these fishes are spotted at birth, but spots appear soon, younger in the *Mollienisia* than in *Gambusia.* In the latter, at least, the black blotches grow in area with age, and only old fish are entirely black.

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[5] Bull. U. S. Fish Comm., XXII, (1902) 1904, p. 225.

NOTES ON THE BREEDING OF THE CALIFORNIA GOPHER SNAKE IN CAPTIVITY

In June, 1924, Mr. Charles E. Woodworth brought to my laboratory a pair of gopher snakes (*Pituophis catenifer heermanni*) which had been caught by children in the neighborhood of Stockton, California. The history of these two snakes before reaching me was as follows. The male had been caught the early part of March the same year and the female on April 11. They were kept separate until they were tamed. On April 21 they were placed together in a cage with several other snakes. Copulation was first noted on the night of April 21. In the morning of April 22 it was again observed. How long it had been in progress before observed is not known, but it was noted to continue between 9.30 a. m. and 12.05 p. m. The female remained quiet during this entire period. The male, however, showed a "nervous" disposition. His head swayed back and forth continuously and he resisted handling by hissing, but not by striking. On April 28 another female gopher snake was put in the cage, and the following day copulation with the original male took place. At this time it was interrupted and the pair were separated.

The first female and the male were brought to Berkeley June 21 and put in a large cage, where they soon adapted themselves to their new home. The female was ascertained to be 97 1-2 cm. in total length, and 94 mm. from tip of nose to posterior edge of the anal plate. There were found to be 26 longitudinal scale rows. The male was not measured but was of nearly the same size. While kept in the laboratory, copulation was attempted several times though without success so far as is known. The presence of people in the room, whether quiet or moving, had no effect on the behavior of the snakes.

Although there were two other gopher snakes of about the same size in the cage with this pair, there were no signs of friendship toward them by either of the mated pair in question. The male and the female stayed in the same part of the cage and seldom mingled with the other snakes, though there were no hostile actions.

As time for egg laying approached there was a noticeable increase in the diameter of the female and also a marked tendency on her part to remain away from all the other snakes. On August 7, five eggs were found in the cage in the corner with the female, and the next day five more were laid. These eggs were not uniform in size. Their average might be roughly said to be one by two inches. They were elliptical, rather truncate ended, in shape, and were covered with a heavy, tough membrane. They were not in any way connected with one another, and were found scattered about the corner of the cage occupied by the female. There was no noticeable attempt on the part of the female to protect, or maintain contact with, the eggs.

On August 9, I opened one of the eggs and found an embryo within, well started in development. Embryonic development had evidently begun some time previous to the laying of the eggs. On the same date the female was killed and dissected and found to contain numerous small ova. The other eggs were kept for a time in damp sand, at room conditions of the air, which varied greatly. One more egg was opened about a week after the first. This second egg contained a dead embryo. Later the rest were found to have died at about the same stage. Development stopped probably on account of the lack of a fairly constant temperature, and humidity, of a proper degree.

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NOTES ON THE HERPETOLOGY OF HOG ISLAND

Hog Island is a small, low island approximately 7 miles long and 3-4 of a mile wide, lying in the Atlantic Ocean about 14 miles off the southern end of Eastern Shore, Northampton Co., Virginia. It is a wooded island, the principal trees being salt-water myrtle (*Baccharis halimifolia*), short leaf pine (*Pinus echinata*), pitch pine (*P. rigida*), sassafras (*Sassafras sassafras*), and a few red maples (*Acer rubrum*). During a visit to the island for the week ending June 21st, the following batrachians and reptiles were noted:

Bufo americanus, Holbrook. Toads are exceedingly abundant all over the island. Their larvæ were noted in great numbers in the rain ponds which dot the island at this time of the year. The toads find an inexhaustible food supply in the myriads of land amphipods (*Orchestia gryllus*) which inhabit the island.

Heterodon contortrix, Linn. "Spread-head moccasins" find on Hog Island in extremely congenial habitat. An abundance of food in the form of the preceding species and the perfect living conditions furnished by the sand dunes and the tangles of scrub pines and myrtles are accountable for their great abundance.

Opheodrys æstivus, Linn. Green snakes are common not only on Hog Island, the only wooded island visited, but on all the neighboring bars and spits where coarse grass and a few scattered myrtle bushes can afford the animals some cover. One specimen was found on Pig Island crawling leisurely through a colony of black skimmers (*Rhynchops nigra*).

Coluber constrictor, Linn. Black snakes are not uncommon on the island. Several individuals were observed in the tops of myrtle trees. Attempts to capture them were not very successful as they generally found the tangle of interlocking branches a convenient

avenue of escape. Those pursued on the ground invariably took to the myrtles.

Natrix sipedon sipedon. Water snakes are common around the several fresh water ponds on the island and in the extensive salt marsh on the landward side.

Chelydra serpentina, Linn. The natives inform me that the snapping turtle is an inhabitant of the island and since their description fits this unmistakable animal, it is included in this list.

Kinosternon subrubrum, Lacepede. Mud turtles or "Box tarrapins" as they are known to the inhabitants, are abundant on the island. They share the fresh-water ponds with the toad larvæ, the water snakes and two species of minnows, *Cyprinodon variegatus* and *Lucania parva.*

Malaclemmys centrata concentrica, Shaw. Diamond-back terrapins may be found in numbers in the salt marshes on the landward side of the island.

Caretta caretta, Linn. Large numbers of loggerhead turtles are caught on the hook and in nets around the island. Quite a few fine examples were observed stranded upon the beach.

Chelonia mydas, Linn. Green turtles are evidently not as plentiful as loggerheads around Hog Island. But one example was observed stranded on the beach.

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